REMARKS

Reconsideration and the timely allowance of the pending claims, in view of the following remarks, are respectfully requested.

In the pending Office Action, the Examiner rejected claims 24-27, 29-31, and 41-42, under 35 U.S.C. §103(a), as being unpatentable over Honda '643 (U.S. Patent No. 5,851,643); rejected claims 28, 37, and 43, under 35 U.S.C. §103(a), as being unpatentable over Honda '643 in view of Suzuki '103 (U.S. Patent No. 6,335,103); and rejected claims 24-27, 29, 40, 42, and 44, under 35 U.S.C. §103(a), as being unpatentable over Futamoto '936 (U.S. Patent No. 6,447,936) in view of Futamoto '893 (U.S. Patent No. 6,183,893).

Prior to the entry of this Amendment, claims 24-31 and 37-44 were submitted for examination, of which claims 24 and 37 are the only independent claims. By this Amendment, Applicants have cancelled claim 43 and have amended independent claims 24 and 37 to provide a clearer presentation of the claimed subject matter. Applicants further submit that the claim changes do not, in any way, introduce new matter. As such, claims 24-31, 37-42, and 44 are currently submitted for examination, of which claims 24 and 37 remain as the only independent claims.

Applicant respectfully traverses the rejections under 35 U.S.C. §103(a) for the reasons presented below.

I. Rejection of Claim 24 Under §103(a) Based On Honda '643

With respect to independent claim 24, the Examiner alleged that Honda '643 teaches a medium that comprises a substrate, a BCC underlayer on the substrate, an HCP underlayer on the BCC layer, and one or more magnetic layers on the HCP layer. (Office Action, par. 5). The Examiner also asserted that suitable materials for the BCC layer include at least one element selected from Cr, Mo, W, V, Nb, and Ta as well as Cr-based BCC alloys containing one or more elements selected from V, Ti, Ru, and Co. (Office Action, par. 5). The Examiner, therefore, concluded that it would have been obvious to utilize a CrTi alloy as the bcc underlayer taught by Honda '643. (Office Action, par. 6). Applicants respectfully disagree.

The present invention, as recited in amended independent claim 24, sets forth a perpendicular magnetic recording medium, comprising;

> a nonmagnetic substrate . . .

> a ***first under layer*** formed on the nonmagnetic substrate, essentially consisting of one of a ***titanium alloy having a hexagonal close-packed structure and a titanium compound*** . . .
>
> a ***second under layer*** formed in contact with the first under layer and ***essentially consisting of ruthenium*** and
>
> a magnetic recording layer formed in contact with the second under layer and containing mainly cobalt.

As recited in claim 24, the first under layer essentially consists of a titanium alloy having an HCP structure and a Ti compound. The Ti compound is supported by the Specification on page 17, lines 1-7. The first under layer is in contact with a second under layer and, by virtue of this configuration, it is possible to obtain a magnetic recording medium having an excellent perpendicular orientation.

Clearly, the claimed first under layer consisting of the Ti alloy does ***not*** have a BCC structure and, unlike the claimed invention, there is nothing in the Honda '643 reference that teaches that the first under layer consists of an HCP structure. In particular, the structure shown in FIG. 1(a) of the Honda '643 reference is a multi-layer film, in which a first magnetic film/a second magnetic film/a nonmagnetic layer/a first magnetic film/a second magnetic film etc. are successively laminated in this order. The under layer disclosed by Honda '643 is formed by TiCr, which has a Cr-based BCC structure – ***not*** a HCP structure, as required by claim 24.

Moreover, the alternative structures shown in FIG. 1(b) to FIG. 1(e) are mentioned as comparative structures (for comparison with the multi-layer film A), and are not structures according to the invention of Honda. For example, the alternative film A shown in FIG. 1(b) has a structure in which a nonmagnetic film is held between first magnetic films. In other words, it has a structure in which magnetic films having the same lattice constants are laminated. In the alternative film B shown in FIG. 1 (c), the first magnetic film and the second magnetic film are not in contact with each other, since a nonmagnetic film is interposed therebetween. The stacked film shown in FIG. 1(d) has only one magnetic layer formed by laminating a first magnetic film and a second magnetic film. FIG. 1(e) shows a single-layer film. Further, FIG. 4 and the description in column 16, lines 40-54 disclose data indicating that the noise of the medium of FIG. 1(a) is remarkably low in comparison with the media shown in FIGS. 1 (b) to 1(e). (See, *e.g.*, Honda '643: Col. 15, line 55 – col. 16, line 54).

Because, as indicated above, the Honda '643 reference fails to teach or suggest the combination of elements recited by independent claim 24, Applicants submit that independent claim 24 is patentably distinguishable over Honda '643.

II. Rejection of Claim 24 Under §103(a) Based On Futamoto '936 & '893

The Examiner also rejected independent claim 24 on the basis that Futamoto '936 teaches a first under layer **12**, a second under layer **23** on the first under layer, a first perpendicular recording layer **13** on the second under layer and a second perpendicular recording layer on the first perpendicular recording layer. (Office Action, par. 30). The Examiner admitted that Futamoto '936 fails to teach the use of Ru as the second under layer and relied on Futamoto '893, which discloses the use of Co alloyed with 25-50% of Cr, Re, W, Nb and in one embodiment $CoRu_{45}$, to allege that claim 24 is rendered obvious.

The Futamoto '893 reference clearly discloses the use of an Co alloy as a second underlayer **13** that contains less than 50 atomic% of a nonmagnetic element. (Futamoto '893: Col. 9, lines 28-34). In particular, Futamoto '893 teaches the specific configuration of 45 atomic% Ru alloyed with Co to provide the second underlayer. (Futamoto '893: Col. 13, lines 17-24). As such, Futamoto '893 teaches that the second underlayer essentially consists of Co.

Unlike the recitations of independent claim 24, there is nothing in either Futamoto '936 or Futamoto'893 that remotely teaches that the second under layer essentially consist of Ru – if anything, these references clearly teach that the second under layer essentially consists of Co.

Because, as indicated above, the Futamoto '936 and Futamoto'893 references fail to teach or suggest the combination of elements recited by independent claim 24, Applicants submit that independent claim 24 is patentably distinguishable over Futamoto '936 and Futamoto'893.

III. Rejection of Claim 37 Under §103(a) Based On Honda '643 & Suzuki '103

With respect to independent claim 23, the Examiner alleged that Honda '643 teaches a multiple magnetic layer structure separated by Ru intermediate layers in which the magnetic layers are suitably CoCrPt alloys. The Examiner also alleged that the multilayer magnetic layer can utilize layers having the same composition and lattice constant. (Office Action, par. 23). The Examiner then relied on Suzuki '103 for allegedly providing that the notion that

0.1-15.0% of O can be incorporated into the magnetic layer to reduce noise in order to render claim 37 unpatentable. (Office Action, par. 24). Applicants respectfully disagree.

The present invention, as recited in amended independent claim 37, sets forth a perpendicular magnetic recording medium, comprising;

> a nonmagnetic substrate; and
>
> a magnetic recording layer formed on the nonmagnetic substrate and having a multi-layered structure including at least two ferromagnetic layers which contain cobalt, platinum, and oxygen, are laminated via ***a nonmagnetic layer essentially consisting of ruthenium***,
>
> wherein the ferromagnetic layers have the same lattice constant and the same total concentration of an added nonmagnetic element.

Honda '643 clearly discloses that the difference between the lattice constants of the magnetic layers in the perpendicular multi-layered magnetic recording film should be 1-5% and, if the difference exceeds 5%, "epitaxial growth cannot be achieved." The reference further discloses that if the lattice constants of the magnetic layers are the same, it is required to select an "appropriate material" for the non-magnetic intermediate layer. (Honda '643: Column 11, line 60 - column 12, line 3).

In contrast, the difference in the lattice constants between Ru and CoPt alloy exceeds 5%, so a layer consisting essential of Ru, as claimed, can be recognized to have a tendency of inhibiting epitaxial growth of CoPt alloy, regardless of the presence or the absence of magnetism. As such, Ru can not be regarded as being the "appropriate material." As such, Honda '643 teaches away from using the claimed Ru and can not, in any way, be reasonably construed as being obvious in view of Honda '643.

Moreover, Suzuki '103 only adds oxygen to a longitudinal magnetic recording layer. It is difficult to combine the layer of Suzuki with the perpendicular magnetic layers of Honda. Further, even if Suzuki and Honda are combined, the present invention cannot be obtained.

IV. Rejection of Claims 29 and 42 Under §103(a)

Futamoto '936 discloses laminating a first underlayer of Ti-Cr, a second under layer of Co-Cr, a first magnetic layer of CoCrPtTa, and a second magnetic layer of CoPt in this order. The second magnetic layer is formed by depositing Co and Pt alternately. Further, Table 1 of Futamoto '936 discloses that CoPd and CoPtPd can be used as the second

magnetic layer. In the medium of Futamoto '936, the first magnetic layer of CoCrPtTa exists between the second magnetic layer formed by depositing Co and Pt alternately and the second underlayer of Co-Cr.

In contrast, in the inventions recited in claims 29 and 42 of the present application, the magnetic recording layer, which has a multi-layered structure prepared by forming ferromagnetic layers and non-magnetic layers alternately, are required to contact the second under layer. Therefore, the medium disclosed in Futamoto '936 and the medium according to claims 29 and 43 of the present invention are entirely different in the structure of the magnetic recording layer formed on the second underlayer.

V. Clarification of Prior Arguments

Applicants apologize for confusing the Examiner by erroneously characterizing the lattice constant of Co as "2.71Å," in our previous response. However, we point out that the calculated value "5.4%" in the previous arguments is correct.

Please note that the lattice constant of Co (hcp) is: a=2.51 Å, c=4.07 Å; the lattice constant of Pt (fcc) is: a=3.92 Å; and the lattice constant of Ru(hcp) is: a=2.71 Å, c=4.28.

With respect to the matching of the crystalline plane of the HCP-CoPt alloy and the crystalline plane of Ru, only (00.1) face being the close-packed face is considered, since the present invention is a perpendicular magnetic recording medium. To obtain the difference in the lattice constants, it suffices to only calculate the "a" axis of the HCP. To calculate the value "a" of the HCP -CoPt alloy, it is necessary to make calculation required by mixing the FCC-Pt, having a different crystalline structure, with the HCP -Co.

In view of the strain of the closed packed face of the FCC and HCP, since the value "a_{fcc}" of the FCC is the length of a side of a (100) plane in the unit lattice of a cube, $a_{fcc}/\sqrt{2}$ being a half length of the diagonal line corresponds to the value "a" of the HCP. The value $a_{fcc}/\sqrt{2}$ of the fcc-Pt is 2.77 Å, which is almost equal to the shortest interatomic distance, and we used this concept. However, we used the lattice constants in calculation, and the value "a" of the alloy if 20 at % of Pt is dissolved in Co with the HCP structure maintained is calculated as follows: $2.51\ Å \times 0.8 + 2.77\ Å \times 0.2 = 2.56\ Å$

This value may not be regarded as a strict value, but it is sufficiently useful in experiments such as X-ray diffraction measurements.

VI. Conclusion

Applicants note that the references of record, including Honda '643, Futamoto '936 &'893, and Suzuki '103, do not cure the deficiencies indicated above and, thus, equally fail to teach or suggest the combination of elements recited in amended independent claims 24 and 37. Applicants further submit that none of the references of record can be reasonably combined with any other reference of record to render the claimed invention unpatentable. As such, Applicants submit that amended independent claims 24 and 37 are patentably distinguishable over all references of record. Dependent claims 25-31, 38-42, and 44 are also patentable by virtue of their additional recitations as well as their dependency to the independent claims.

In view of the foregoing amendments and remarks, Applicants respectfully submit claims 24-31, 37-42, and 44 are patentably distinguishable over all references of record. Accordingly, withdrawal of the rejections under §103(a) is respectfully requested.

All matters having been addressed, Applicants respectfully requests the entry of this Amendment, the Examiner's reconsideration of this application, and the immediate allowance of pending claims 24-31, 37-42, and 44. Applicants' Counsel remains ready to assist the Examiner in any way to facilitate and expedite the prosecution of this matter.

Please charge any fees associated with the submission of this paper to Deposit Account Number 033975. The Commissioner for Patents is also authorized to credit any over payments to the above-referenced Deposit Account.

Respectfully submitted,
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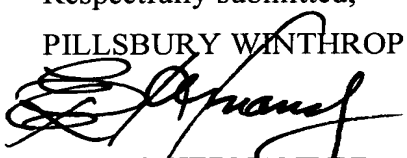

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